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6. Process according to ~~one of the preceding~~ claims, **characterized in that** the melting is preceded by a step of preheating the vitrifiable materials to at most 900°C.
7. Process according to ~~one of the preceding~~ claims, **characterized in that** the vitrifiable materials comprise batch materials and/or cullet and/or vitrifiable scrap and/or combustible elements, especially glass-plastic composites, glass-metal composites, organic materials, or coal.
8. Process according to ~~one of the preceding~~ claims, **characterized in that** the refining operation is carried out on the molten vitrifiable materials of the glass type in the foamy state, having especially a density of approximately 0.5 to 2 g/cm³.
9. Process according to Claim 8, **characterized in that** the refining is carried out on molten vitrifiable materials of the glass type in the foamy state, most of the bubbles being at least 100 or even at least 200 μm in diameter.
10. Process according to ~~one of the preceding~~ claims, **characterized in that** the vitrifiable materials contain refining promoters, especially reducing additives of the coke type, preferably having an average particle size of less than 200 μm, sulphates, or fluorine- or chlorine-based additives, or nitrates of the NaNO₃ type.
11. Process according to ~~one of the preceding~~ claims, **characterized in that** the melting is carried out at 1400°C at most, especially 1380 or 1350°C at most, and the refining at 1500°C at most.
12. Process according to ~~one of the preceding~~ claims, **characterized in that** the refining is carried out in at least one static compartment lying downstream of the melting chamber (2), of the flow-canal type (9), and provided with one or more means for forcing the

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chamber (2) below the level of the mass of vitrifiable materials being melted.

a 5 18. Apparatus for melting and refining vitrifiable materials, especially intended for implementing the process according to one of the preceding claims, **characterized in that** it comprises:

→ at least one melting chamber (2) equipped with burners (5) which are fed with fossil fuel(s) of the natural gas type and with oxidizer(s) of the air or oxygen type, the said burners being placed so as to inject the said fuels/gases or gases resulting from their combustion below the level of the mass (7) of vitrifiable materials introduced into the said melting chamber;

15 → means for refining the molten vitrifiable materials in the form of a "thin layer", in the actual melting chamber (2) or in at least one refining compartment (9, 21) downstream of the said chamber.

19. Apparatus according to Claim 18, **characterized in that** the refining compartment(s) (9) is(are) static and has(have) a flow canal comprising a channel (10) and a roof (11), the one or more means of forcing the molten vitrifiable materials to be refined in the said canal in a thin layer, with flow of the plug-flow type, especially over a depth of less than 15 cm, being at least the selection of the ratio of the average height to the average width of the said canal, this ratio being less than 1 and especially less than 0.5.

a 20. Apparatus according to Claim 18 ~~or 19~~, **characterized in that** the refining compartment(s) is(are) static and has(have) a flow canal comprising a channel (10) and a roof (11), the one or more means for forcing the molten vitrifiable materials to be refined in the said canal in a thin layer, especially over a depth of less than 15 cm, being at least one or more means for adjusting/regulating the flow of the molten

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vitriifiable materials at the inlet and/or at the outlet of the refining compartment (9).

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21. Apparatus according to ~~one of Claims 18 to 20~~, **characterized in that** the flow canal (9) is equipped with heating means, especially of the type having oxygen burners (13), above the molten vitriifiable materials.

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22. Apparatus according to ~~one of Claims 18 to 21~~, **characterized in that** the flow canal is provided with means for homogenizing the vitriifiable materials.

23. Apparatus according to Claim 18, **characterized in that** the melting chamber (2), or a refining compartment downstream of the latter, comprises at least one structural means for thin-film refining, in the form of at least two adjacent walls (53, 53') which are approximately mutually parallel, intended to be at least partially submerged in the mass of molten vitriifiable materials and inclined with respect to the sieve of the said chamber or of the said compartment.

24. Apparatus according to Claim 23, **characterized in that** these walls are incorporated into at least one longitudinally partitioned tubular element (50), especially having an approximately rectangular section.

25. Apparatus according to Claim 24, **characterized in that** this or these tubular element(s) (50) (is) are in the melting chamber (2) and emerge(s) in the discharge opening (8) downstream of the said chamber.

26. Apparatus according to Claim 18, **characterized in that** the refining compartment includes at least one device (21) capable of being rotated in order to ensure centrifugal refining, the internal walls (33) of the said device defining approximately a cavity in the form of a hollow cylinder which is vertical in its central part.

27. Apparatus according to Claim 26, **characterized in that** the device (21) capable of being rotated is

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provided in the cavity with partitions (34) over at least part of its height, forcing the molten vitrifiable materials to flow between the internal walls (33) of the device and the said partitions (34),
5 the average distance between the walls and the partitions defining the "thickness" of the thin layer.

28. Apparatus according to Claim 27, **characterized in that** the average distance between the walls and the partitions is defined by a ratio of their radii $R1/R0$
10 of at least 0.8.

29. Apparatus according to one of Claims 26 to 28, **characterized in that** the walls of the device are lined with refractory pieces (32) of the electrocast type, these including a thermal insulator (31) incorporated
15 so as to avoid being crushed by the centrifugal force.

30. Apparatus according to ~~one of Claims 26 to 29~~, **characterized in that** the device (21) is provided with one or more means for trapping solid particles, these being especially located in its lower zone (23) and
20 being in the form of notches/grooves (28) made in its internal walls (33).

a 31. Apparatus according to ~~one of Claims 18 to 30~~, characterized in that the melting chamber (2) is equipped with at least one means of introducing
25 vitrifiable materials below the level of the mass of vitrifiable materials being melted, especially at least two of them, preferably in the form of one or more openings associated with a supply means of the feed-screw type.

a 32. Apparatus according to ~~one of Claims 18 to 31~~, **characterized in that** the walls of the melting chamber (2), especially those intended to be in contact with the mass of vitrifiable materials being melted, are based on refractory materials associated with a cooling
35 system using a fluid of the water type.

33. Apparatus according to ~~one of Claims 18 to 32~~

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37. Application of the process according to one of Claims ~~1 to 18~~ or of the apparatus according to one of Claims ~~19 to 36~~ to the manufacture of flat glass, especially flat glass having a residual blue colour and a solar-protection or fire-resistance function, for the electronics industry, to the manufacture of glass hollow-ware of the bottle or flask type, or to the manufacture of glass wool or of glass fibre for reinforcement.